

## SHORT CONTACT TIME CATALYTIC SULFUR RECOVERY SYSTEM FOR REMOVING H<sub>2</sub>S FROM A WASTE GAS STREAM

### CROSS REFERENCE TO RELATED APPLICATIONS

*WAL*  
*WAL* [0001] This application claims the benefit under 35 U.S.C. § 119(e) of U.S. Provisional Patent Application No. 60/256,440 filed December 18, 2000. This application is also a continuation-in-part of co-pending U.S. Patent Application No. 09/742,999 filed December 20, 2000, *Pat. 6,579,510* which is a continuation-in-part of co-pending U.S. Patent Application No. 09/625,710 filed July 25, 2000, *pending* which claims the benefit under U.S.C. § 119(e) of U.S. Provisional Patent Application No. 60/146,635 filed July 30, 1999.

### BACKGROUND OF THE INVENTION

#### Technical Field of the Invention

[0002] The present invention generally relates to sulfur recovery processes and apparatus for removing hydrogen sulfide from waste gas. More particularly, the invention relates to such processes that avoid thermally combusting H<sub>2</sub>S and to apparatus that does not include a conventional Claus thermal reactor.

#### Description of the Related Art

[0003] In many industrial situations today it is desirable to prepare elemental sulfur from H<sub>2</sub>S or gaseous mixtures containing moderate to high concentrations of H<sub>2</sub>S. Often this is done in conjunction with cleaning up gaseous petroleum feed streams that contain H<sub>2</sub>S, since sulfur is generally considered undesirable in most petroleum refining products and the quality of the various petroleum fractions may be upgraded by removing the sulfur content. For example, a natural gas stream containing H<sub>2</sub>S is treated to remove the H<sub>2</sub>S, and the H<sub>2</sub>S rich gas fed to a modified Claus sulfur recovery unit which converts the H<sub>2</sub>S to elemental sulfur. In the modified Claus process, hydrogen sulfide is partially combusted with air in a reaction furnace to form sulfur dioxide. The combustion gases are cooled in a waste heat boiler in which a portion of the uncombusted hydrogen sulfide reacts with sulfur dioxide to form elemental sulfur and water vapor. The partially converted mixture then flows to a condenser where the elemental sulfur is removed in molten form. The remaining gases are then heated and passed over a catalytic converter bed for further conversion to elemental sulfur and then again cooled to condense incremental sulfur. From one to four stages of reheat, conversion and condensing are typically